GRADE 12 DIPLOMA EXAMINATION

Biology 30

June 1992

Alberta
EDUCATION

GRADE 12 DIPLOMA EXAMINATION
BIOLOGY 30

DESCRIPTION

Time allotted: 2.5 hours

Total possible marks: 100

This is a **closed-book** examination consisting of **two** parts:

PART A has 70 multiple-choice questions each with a value of one mark.

PART B has five written-response questions for a total of 30 marks.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

GENERAL INSTRUCTIONS

Fill in the information required on the answer sheet and the examination booklet as directed by the presiding examiner.

Carefully read the instructions for each part before proceeding.

DO NOT FOLD EITHER THE ANSWER SHEET OR THE EXAMINATION BOOKLET.

The presiding examiner will collect your answer sheet and examination booklet and send them to Alberta Education.

JUNE 1992

PART A

INSTRUCTIONS

In this part of the examination, there are 70 multiple-choice questions each with a value of one mark.

Read each question carefully and decide which of the choices **best** completes the statement or answers the question. Locate that question number on the separate answer sheet provided and fill in the space that corresponds to your choice. **Use an HB pencil only**.

Example **Answer Sheet**

This diploma examination is for the subject of ● Ⓑ Ⓒ Ⓓ

A. biology
B. physics
C. chemistry
D. mathematics

If you wish to change an answer, erase your first mark completely.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

DO NOT TURN THE PAGE TO START THE EXAMINATION UNTIL TOLD TO DO SO BY THE PRESIDING EXAMINER.

1. Kidney cells functioning at a high rate of active transport require large numbers of which organelle?

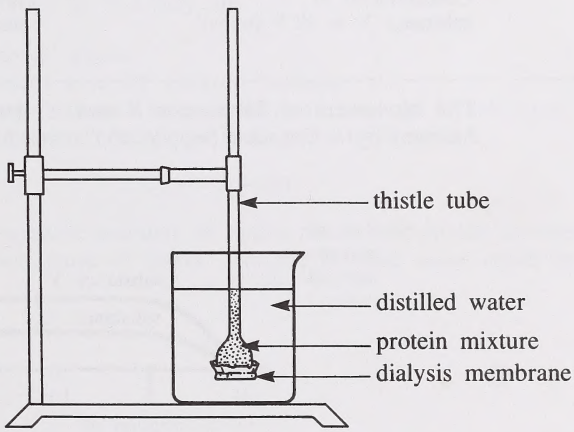
   A. Ribosome
   B. Lysosome
   C. Mitochondrion
   D. Endoplasmic reticulum

2. A drug called dimethylaminoethanol strengthens and stabilizes lysosome membranes. This drug increases the survival rate of aging cells by preventing the

   A. rapid division of cells
   B. production of metabolic hormones
   C. active transport of competitive inhibitors
   D. release of digestive enzymes within the cytoplasm

Use the following diagram to answer question 3.

A Demonstration of Osmosis



3. Given that the dialysis membrane is permeable to small molecules but impermeable to protein, the best prediction that can be made from the diagram is that

   A. osmosis will occur, resulting in a net gain of water in the thistle tube

   B. diffusion will occur, resulting in a decrease of the protein mixture in the thistle tube

   C. osmosis and diffusion will both occur, resulting in equal concentrations of protein and water in the beaker

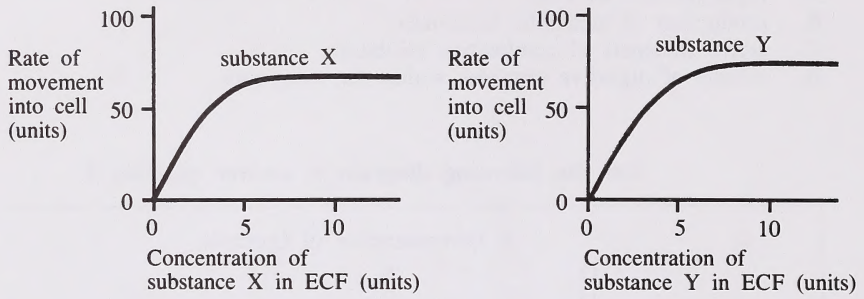
   D. osmosis and diffusion will both occur, resulting in equal concentrations of protein and water in the thistle tube

4. Cell membranes have the capacity to move solute particles from a region of lower concentration to a region of higher concentration by a process called

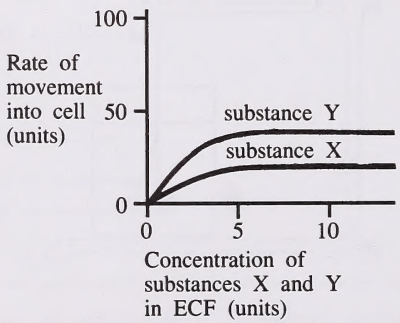
   A. osmosis
   B. diffusion
   C. phagocytosis
   D. active transport

Use the following graphs to answer question 5.

The Movement of Substances X **or** Y into a Cell
Assisted by a Constant Supply of Carrier Molecules



The Movement of Substances X **and** Y into a Cell
Assisted by a Constant Supply of Carrier Molecules



5. From the data given, which conclusion would be logical?

   A. Increasing the number of carrier molecules will increase the rate of movement for substance Y but not for substance X.

   B. Continuing to increase the concentrations of substances X and Y in the ECF will increase the rate of movement for each substance.

   C. Substances X and Y compete for the same carrier molecules.

   D. Substances X and Y diffuse into the cell at equal rates.

6. Carrier molecules and enzymes have many characteristics in common. Which statement about these two types of molecules is **not** true?

   A. Both types are complex lipid molecules.

   B. Both types have active sites for which similar-shaped substances compete.

   C. Both types may become saturated and thus their rate of transport or reaction may be limited.

   D. Both types demonstrate specificity and thus have complementary surface shapes with some other substances.

7. Homeostasis in body systems is maintained by

   A. positive feedback
   B. negative feedback
   C. enzyme activation
   D. competitive inhibition

8. All vitamins are similar in that they are

   A. used as an energy source
   B. organic substances used for enzyme function
   C. required in large amounts because they are used up in reactions
   D. fat-soluble substances needed for body parts to function

9. The presence of excessive amounts of hydrochloric acid in the stomach is often considered to be one cause of ulcers. Another possible cause could be excessive amounts of

   A. bile
   B. pepsin
   C. lipase
   D. amylase

10. A low concentration of carbohydrates is normally found in cytoplasm because carbohydrates are

    A. the building blocks of plasma membranes
    B. the building blocks of protein
    C. used as a source of energy
    D. fat soluble

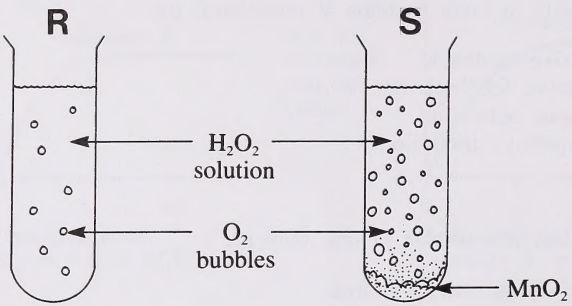
Use the following information to answer questions 11 and 12.

Hydrogen peroxide, H_2O_2, is an unstable compound, which breaks down as illustrated in this chemical reaction:

$$\underset{\text{hydrogen peroxide}}{2H_2O_2} \longrightarrow \underset{\text{water}}{2H_2O} + \underset{\text{oxygen}}{O_2}$$

Equal amounts of 3% hydrogen peroxide solution were added to test tubes labelled R and S. Test tube R served as a control.

When manganese(IV) oxide, MnO_2, was added to the contents of test tube S, it was observed that H_2O_2 broke down more quickly.



11. In liver cells, the substance with a similar function to MnO_2 is

A. an enzyme
B. a substrate
C. an end product
D. a competitive inhibitor

12. When the reaction in test tube S ended, more hydrogen peroxide was added to test tube S and a second, similar reaction took place as quickly as the first. Which assumption about the **first** reaction in test tube S is the most probable?

A. Both the hydrogen peroxide and the manganese(IV) oxide were used up.

B. Neither the hydrogen peroxide nor the manganese(IV) oxide was used up.

C. The hydrogen peroxide was used up and the amount of manganese(IV) oxide remained unchanged.

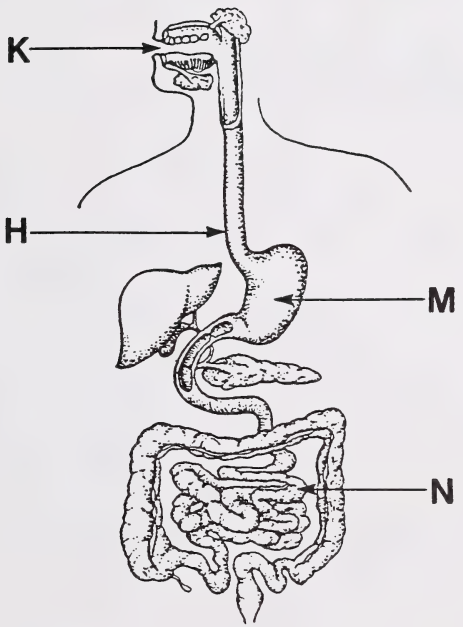
D. The manganese(IV) oxide was used up and the amount of hydrogen peroxide remained unchanged.

13. Functions of the large intestine include

A. digesting starch, absorbing water, and storing wastes
B. digesting fats, absorbing water, and storing minerals
C. absorbing minerals, storing vitamins, and secreting digestive enzymes
D. absorbing vitamins, regulating water balance, and housing beneficial bacteria

Use the following diagram to answer question 14.

The Human Digestive System



14. A student ate a lean beef hamburger. Where in the digestive system did the lean beef pattie **first** undergo **chemical** digestion?

A. H
B. K
C. M
D. N

Use the following information to answer questions 15 to 17.

In a laboratory investigation, a student was given five different samples of unknown food and water mixtures and one sample containing only distilled water. The student tested the samples and recorded these results:

Sample Tested	Test Results			
	Benedict's reagent	Iodine	Biuret solution	Sudan IV
I	yellow-green	pale yellow-brown	blue	does not dissolve
II	blue	pale yellow-brown	purple/ pink	does not dissolve
III	yellow-orange	pale yellow-brown	blue	does not dissolve
IV	blue	pale yellow-brown	blue	dissolves
V	blue	black	purple/ pink	does not dissolve
VI	blue	pale yellow-brown	blue	does not dissolve

15. Which sample served as a control for the investigation?

A. I
B. III
C. V
D. VI

16. Bile would assist in the digestion of food found in which sample?

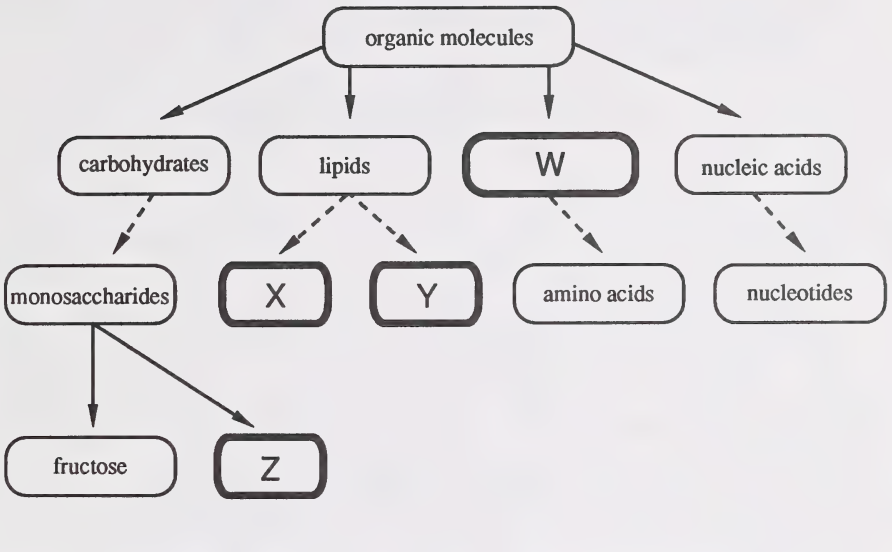
A. II
B. III
C. IV
D. V

17. If a person ate the type of food contained in sample II, there could be an increase in the body's production of

A. urea
B. glucose
C. glycogen
D. fatty acid

Use the following concept map to answer question 18.

A Classification of Biologically Important Substances



Note:

→ indicates a division of a larger category into more specific groups

---→ indicates a digestive process

18. Substances labelled W, X, Y, and Z are, respectively,

A. proteins, fats, oils, and sucrose
B. polysaccharides, fats, oils, and sucrose
C. hormones, fatty acids, glycerol, and starch
D. proteins, fatty acids, glycerol, and glucose

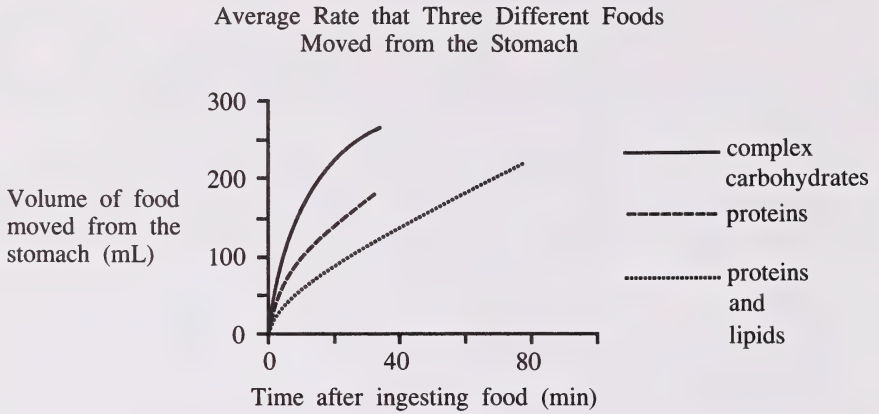
---

19. In his classic conditioning experiment, Pavlov rang a bell immediately before presenting food to a dog. After many trials, the dog salivated as soon as the bell was rung and before food was presented. The dog's response is an example of the release of digestive enzymes by

A. neural control
B. hormonal control
C. voluntary control
D. mechanical control

Use the following information to answer question 20.

Under controlled conditions, three groups of people ingested 300 mL of different foods in liquid form. One group was given complex carbohydrates, another group was given proteins, and the remaining group was given proteins and lipids. The average rate at which these foods moved from the stomach into the small intestine was then graphed.



20. The best interpretation that can be made from the graph is that

A. fatty foods slow the emptying of the stomach
B. proteins are easier to digest than complex carbohydrates
C. complex carbohydrates are digested more slowly than proteins
D. protein-rich foods leave the stomach more slowly than fatty foods

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21. The greatest volume of carbon dioxide is released from the blood while the blood is travelling through the

A. veins that lead to the kidneys
B. veins that lead to the right atrium
C. capillaries in the skeletal muscles
D. capillaries surrounding the alveoli

22. Stretch receptors that respond to changes in blood pressure are located in the

A. arterioles and the venules
B. aorta and the carotid arteries
C. capillaries and the lymph vessels
D. venae cavae and the pulmonary arteries

Use the following table to answer question 23.

Subject	Blood Composition			
	Erythrocytes per μL	Leukocytes per μL	Glucose mg/100 mL	Plasma Proteins mg/100 mL
I	2 500 000	10 000	300	8 000
II	5 000 000	3 500	98	9 000
III	7 000 000	7 100	205	8 050
IV	7 000 000	6 900	100	6 000
Normal	5 000 000	7 000	100	8 000

23. Which subject is most likely an untreated diabetic who lives at a relatively high altitude?

A. I
B. II
C. III
D. IV

Use the following information to answer question 24.

In a normal heart, the electrical impulses initiated by the SA node travel through the AV node, causing the ventricles to contract. The AV node acts as a checkpoint by blocking impulses that are too closely spaced. In a serious heart disorder such as Wolff-Parkinson-White syndrome, there is an additional band of conducting tissue that allows nerve impulses to bypass the AV node and travel directly to the ventricles. As a result, the heart rate can increase to 300 beats per minute.

24. Why could blood pressure fall to a dangerously low level in a person with Wolff-Parkinson-White syndrome?

A. There is insufficient time for the ventricles to fill between heartbeats.

B. There is a general constriction of capillary bed vessels throughout the body.

C. The medulla oblongata stimulates the SA node to slow the heart rate below normal.

D. There is backflow of blood into the ventricles from the aorta and the pulmonary artery.

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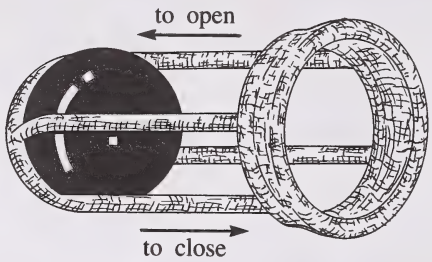
25. Blood type AB contains

A. A antibodies and B antigens
B. A antigens and B antibodies
C. A and B antibodies but no A and B antigens
D. A and B antigens but no A and B antibodies

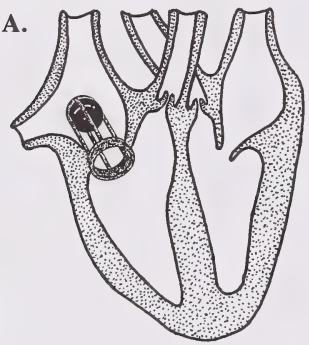
Use the following diagram to answer question 26.

An Artificial Heart Valve in the Open Position

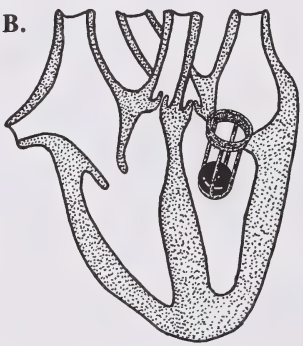


26. In which diagram is the artificial valve correctly positioned to replace the left atrioventricular (bicuspid) valve?

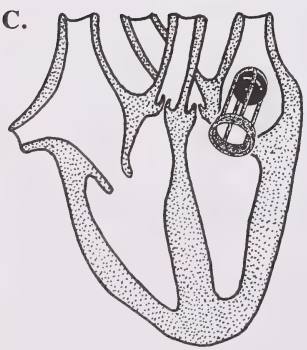
A.



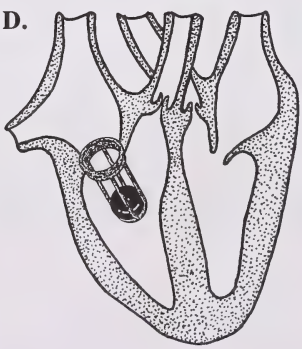
B.



C.



D.



27. Which row correctly matches the heart chamber with its main blood vessel **and** describes the condition of blood within that same blood vessel?

Row	Heart Chamber	Main Blood Vessel Leading into or away from Chamber	Condition of Blood in the Main Blood Vessel
A	right atrium	aorta	oxygenated
B	right atrium	superior vena cava	deoxygenated
C	left ventricle	superior vena cava	oxygenated
D	left ventricle	aorta	deoxygenated

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28. An increase in blood pressure in the capillaries causes

A. a decrease in the volume of lymphatic fluid
B. a decrease in the volume of interstitial fluid
C. an increase in the volume of interstitial fluid
D. an increase in the production of plasma proteins in the blood

29. Carbon monoxide prevents oxygen transport to the cells because carbon monoxide

A. combines with oxygen in the blood
B. forms a stable compound with hemoglobin
C. combines with antigens on the cell membrane
D. prevents passage of red blood cells through the capillaries

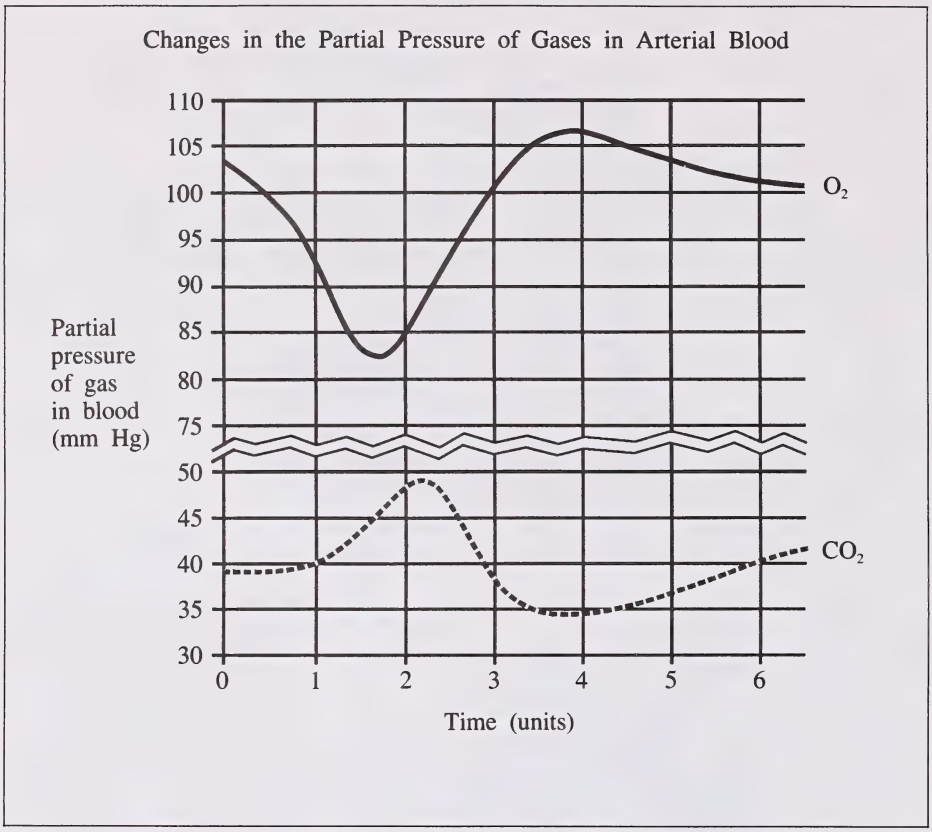
30. The correct order of structures through which inhaled air travels to the lungs is

A. pharynx, trachea, and bronchi
B. trachea, pharynx, and bronchioles
C. pharynx, bronchioles, and bronchi
D. trachea, bronchioles, and bronchi

31. Human lungs inflate as a result of

A. reduced chest cavity pressure
B. relaxation of the chest muscles
C. reduced volume of the chest cavity
D. contraction of the bronchial muscles of the lungs

Use the following graph to answer question 32.

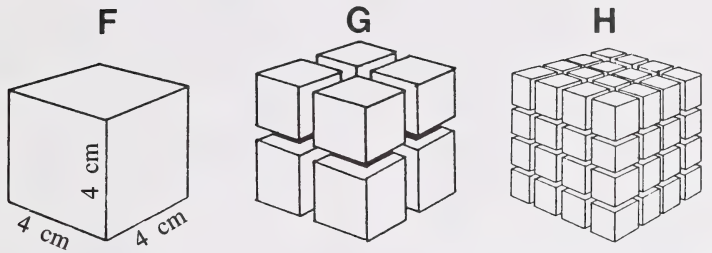


32. At what time will the respiratory centres in the medulla oblongata receive the greatest **direct** stimulation?

A. 1.7 units
B. 2.2 units
C. 3.5 units
D. 4.0 units

Use the following diagrams to answer question 33.

Three Representations of a Given Volume



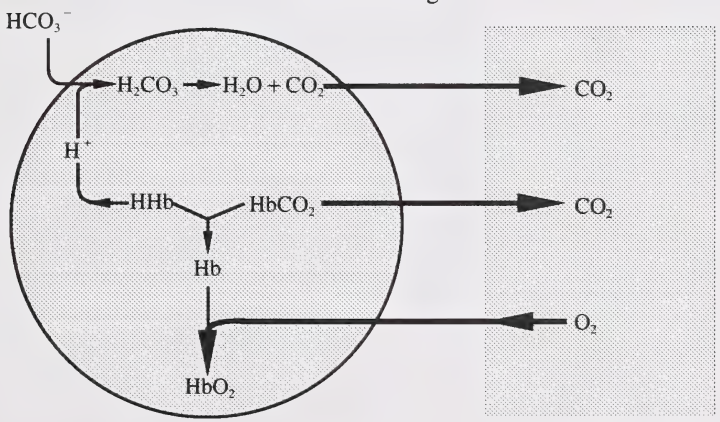
Volume = 64 cm^3 64 cm^3 64 cm^3

33. Compared with diagrams F and G, diagram H is a good representation of a lung because it illustrates the

A. air spaces in a lung
B. arrangement of alveoli in a lung
C. air capacity of the alveoli in a lung
D. surface area of the alveoli in a lung

Use the following diagram to answer question 34.

Gas Exchange

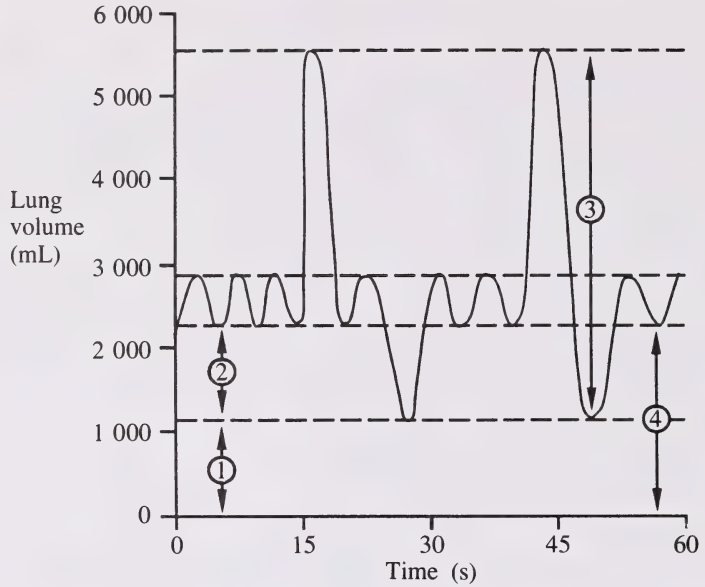


34. The hemoglobin molecule (Hb) in red blood cells is capable of carrying

A. H^+, CO_2, and O_2
B. O_2 only
C. CO_2 and O_2 only
D. H^+, plasma, and O_2

Use the following information to answer question 35.

Lung Volume Corresponding to Various Depths of Breathing



35. The volume of air that remains in the lungs after a forceful exhalation is indicated by the portion of the graph labelled

A. 1
B. 2
C. 3
D. 4

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36. An important property of adenosine triphosphate (ATP) is that it

A. acts as a respiratory coenzyme
B. contains useable potential energy
C. transports energy from cell to cell
D. forms very stable bonds with phosphate

37. Which statement describes what happens to ATP during both aerobic and anaerobic respiration?

A. There is a net loss of ATP.
B. The level of ATP does not change.
C. No ATP is used but some is gained.
D. A greater amount of ATP is gained than is used.

Use the following table to answer question 38.

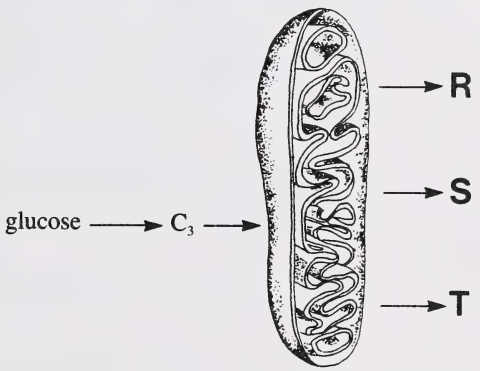
Relative Concentration of Substances Found in Venules				
Blood Sample	Substance			
	Glucose	Oxygen	Lactic Acid	Carbon Dioxide
W	low	high	high	low
X	low	low	low	high
Y	low	low	high	high
Z	high	low	high	low

38. Blood leaving a fatigued muscle would **best** be represented by sample

A. W
B. X
C. Y
D. Z

Use the following diagram to answer question 39.

The Movement of Substances Into and Out of a Mitochondrion



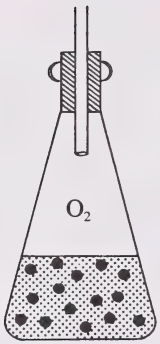
39. The cellular respiration products R, S, and T that leave the mitochondrion are

A. lactic acid, CO_2, and H_2O
B. lactic acid, ADP, and ATP
C. H_2O, ADP, and CO_2
D. CO_2, ATP, and H_2O

Use the following information to answer question 40.

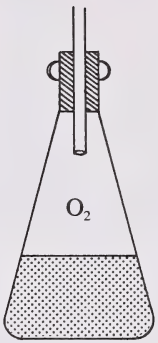
An Experiment to Demonstrate Metabolism in Animal Cells

I



Flask I contents:
live animal cells
glucose solution
CO_2 indicator

II



Flask II contents:
glucose solution
CO_2 indicator

Note: The diagrams represent the initial state of the experiment.

40. Which is the **best** prediction of the outcome of this experiment?

A. The test for CO_2 will be positive in flask I.

B. The test for CO_2 will be positive in flask II.

C. The test for CO_2 will be negative in flask I because a different gas is produced.

D. The test for CO_2 will be negative in flask II because a different gas is produced.

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41. Which structure transports urine from the kidney to the urinary bladder?

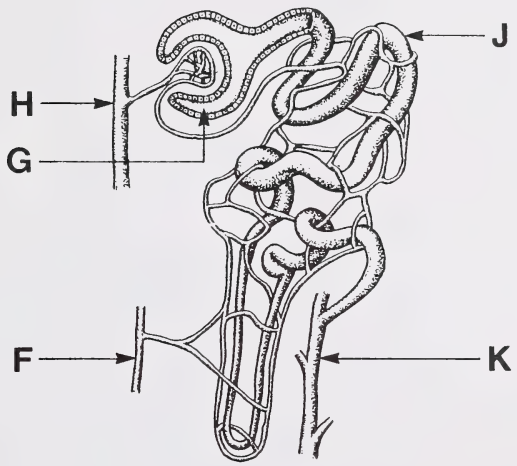
A. Ureter
B. Urethra
C. Loop of Henle
D. Collecting duct

42. Which metabolic wastes are removed from the blood by nephrons?

A. Urea, glucose, and water
B. Urea, hydrogen ions, and water
C. Amino acids, glucose, and carbon dioxide
D. Amino acids, hydrogen ions, and carbon dioxide

Use the following diagram to answer question 43.

A Human Nephron

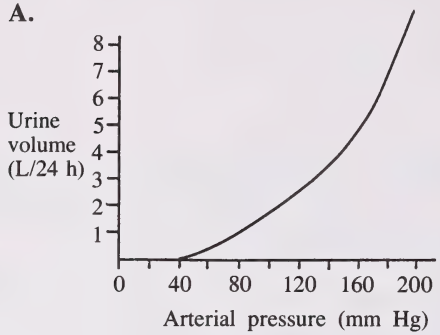


43. In a healthy person, the sequence of structures through which a molecule of glucose passes is

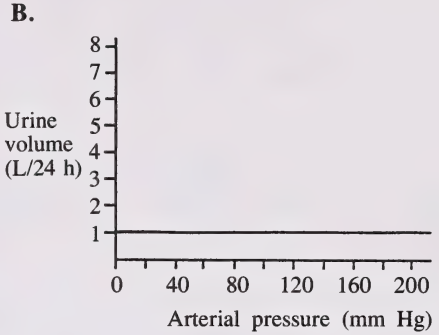
A. F, J, G, and H
B. G, J, F, and K
C. H, G, J, and F
D. H, J, G, and K

44. Which graph **best** represents the relationship between arterial blood pressure in the kidney and urinary volume output in litres per 24 hours?

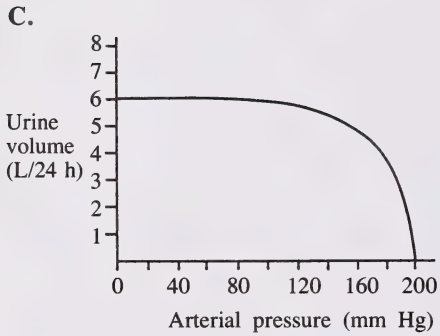
A.



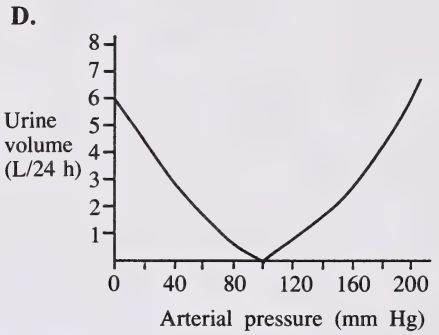
B.



C.



D.



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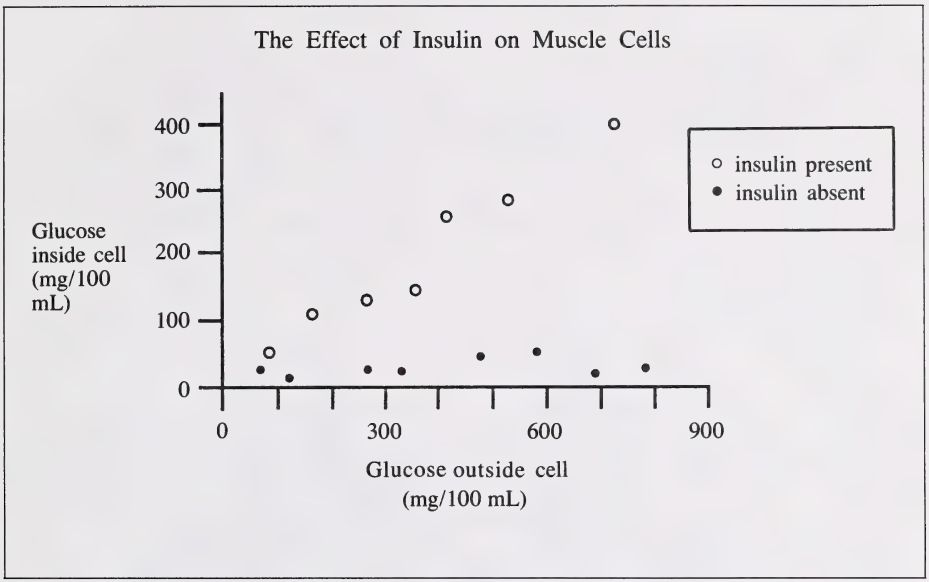
45. Thyroxine may be used to treat overweight people who suffer from an endocrine imbalance. This treatment will directly

A. decrease the appetite
B. increase the metabolic rate
C. accelerate the conversion of glucose to glycogen
D. inhibit the conversion of fatty acids and glycerol to fat

46. In an emergency situation, which physiological response in humans would likely occur because of the release of adrenaline?

A. Dilation of pupils
B. Constriction of lung air passages
C. Decrease in arterial blood pressure
D. Increase in blood flow to digestive organs

Use the following graph to answer questions 47 and 48.



47. According to the "lines of best fit" for the graph, which row of data is correct?

Row	Insulin	Concentration of Glucose	
		Outside Cell (mg/100 mL)	Inside Cell (mg/100 mL)
A	present	600	0
B	absent	300	150
C	absent	400	200
D	present	500	300

48. Which inference is **correct**?

A. If glucose outside the cell is high and insulin is absent, then glucose inside the cell is high.

B. If glucose outside the cell is low and insulin is present, then glucose inside the cell is high.

C. Insulin makes the cell membrane more permeable to glucose, thereby facilitating glucose transport into the cell.

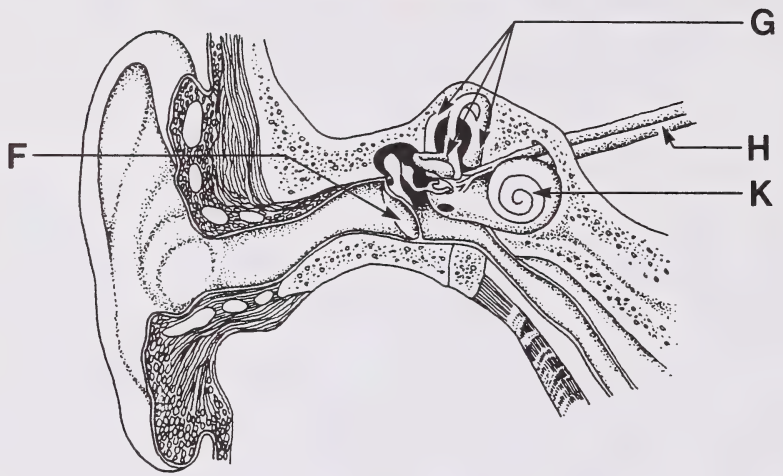
D. Insulin promotes the chemical breakdown of glucose, thereby reducing its molecular size so that it can enter the cell.

49. If the curvature along the horizontal axis of the cornea of a human eye is less than the curvature along the vertical axis, then the result will be

A. astigmatism
B. farsightedness
C. nearsightedness
D. tunnel vision

Use the following diagram to answer question 50.

The Human Ear



50. Some children like to twirl around in one place. After they stop twirling, they feel as though they are still moving. This feeling is caused by continued

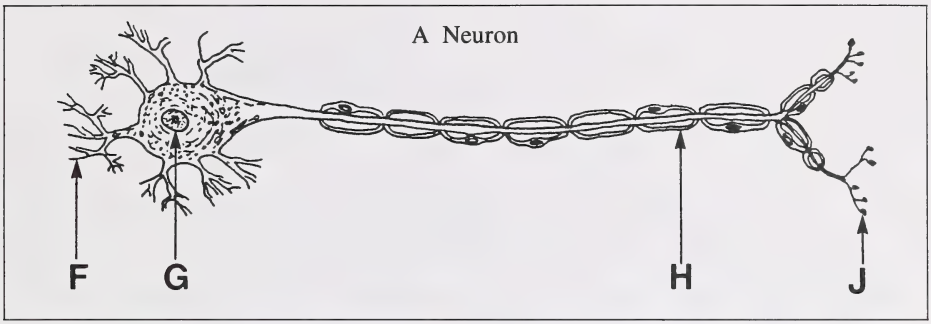
A. vibrations of F
B. movement of fluid in G
C. movement of fluid against K
D. transmission of nerve impulses from K to H

---

51. The ear structure that converts the mechanical energy of sound to nerve impulses is the

A. organ of Corti
B. eustachian tube
C. tympanic membrane
D. third ossicle (stirrup)

Use the following diagram to answer question 52.



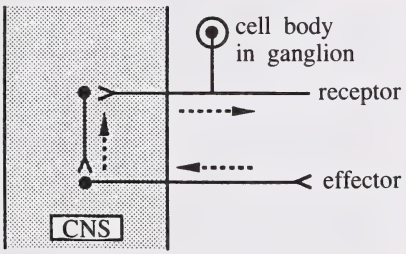
52. Acetylcholine is produced at

A. F
B. G
C. H
D. J

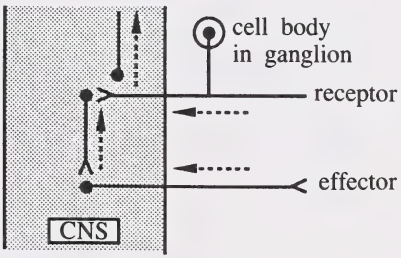
---

53. In which diagram do the arrows show the direction of a nerve impulse generated in the normal fashion?

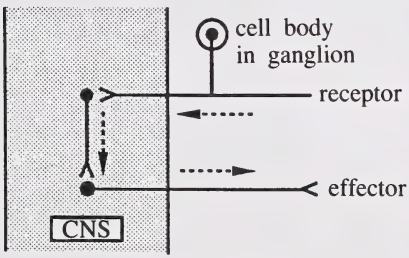
A.



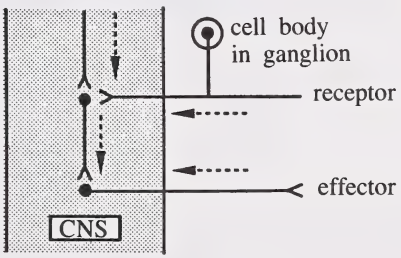
B.



C.



D.



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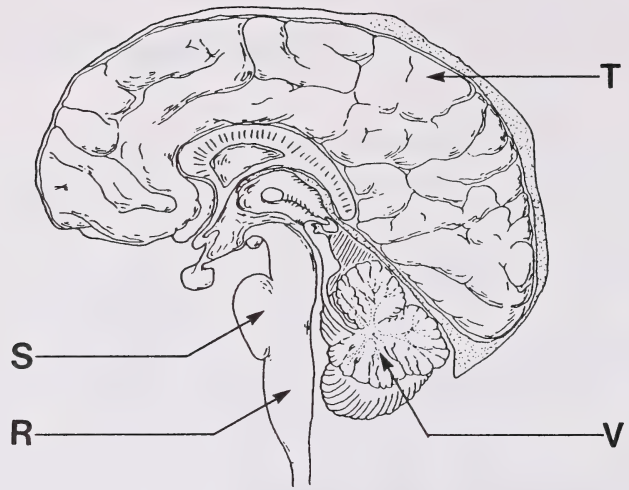
54. During the refractory period of a neural transmission sequence, the

A. calcium ions diffuse out of the neuron
B. chloride ions diffuse out of the neuron
C. sodium ions are pumped out of the neuron
D. potassium ions are pumped out of the neuron

Use the following diagram to answer question 55.

A Section of the Human Brain



55. Signals coming in from sensory organs are integrated with impulses from the cerebrum, resulting in co-ordination of muscular movement. This co-ordination takes place in the structure labelled

A. R
B. S
C. T
D. V

---

56. The sympathetic nervous system would likely be most active while a person is

A. running a race
B. digesting a large meal
C. sleeping in the afternoon
D. recovering from an illness

57. In which structures is glycogen most likely to be stored?

A. Liver and kidneys
B. Liver and skeletal muscles
C. Skeletal muscles and kidneys
D. Skeletal muscles and pancreas

58. Cardiac muscle produces very little lactic acid. Therefore, it can be assumed that cardiac muscle

A. always contracts at the same rate
B. uses large amounts of glucose
C. functions mainly aerobically
D. lacks mitochondria

Use the following information to answer question 59.

While investigating skeletal muscle function, a student made the following observations.

I. The muscle shortened when it contracted.
II. The muscle tired after continuous flexing.
III. The skin temperature increased as muscle activity increased.
IV. The muscle increased in diameter when it contracted.
V. The muscle returned to its original length when it relaxed.
VI. The heart rate increased as muscle activity increased.

The student then formed the hypothesis that muscle fibres fold up on one another when contraction takes place.

59. Which observations most likely led to the development of the hypothesis?

A. I, II, and IV
B. I, IV, and V
C. II, IV, and V
D. III, IV, and VI

---

60. In severe cases of arthritis, the cartilage that normally separates the bones in joints is gradually destroyed and replaced by hard bands of calcium compounds. These hard bands result in

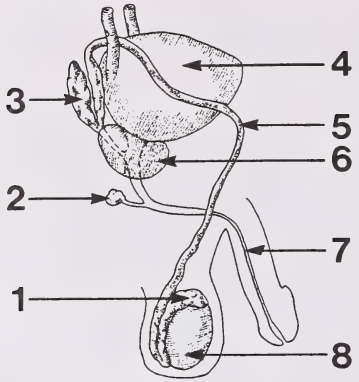
A. loss of mobility of the joint
B. damage to tendons at their insertion point
C. loss of contraction of the adjacent muscles
D. interference with motor nerve impulse transmission

61. If a viral infection destroys the endocrine tissue of both testes in a human male, there will be an increase in

A. ovarian tissue
B. skeletal muscle mass
C. the level of LH (ICSH) in the blood
D. the level of testosterone in the blood

Use the following diagram to answer question 62.

The Male Reproductive System



62. The structures that produce components of semen are

A. 1, 2, 3, and 7
B. 1, 4, 5, and 8
C. 2, 3, 4, and 6
D. 2, 3, 6, and 8

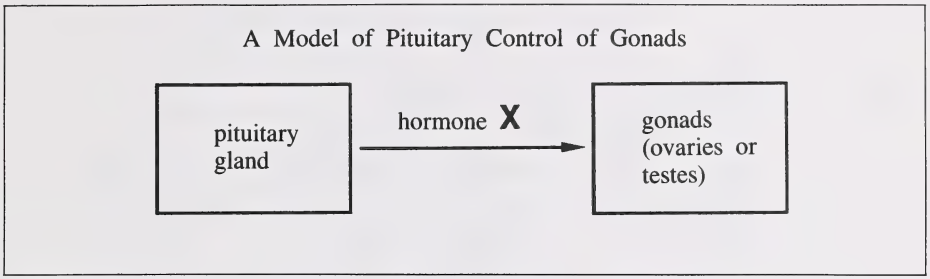
Use the following diagram to answer question 63.

A Human Sperm Cell

63. The acrosome of a sperm cell releases the enzyme hyaluronidase, which helps the sperm penetrate the egg during fertilization. Which organelle is most like the acrosome in function?

A. Endoplasmic reticulum
B. Mitochondrion
C. Lysosome
D. Ribosome

Use the following diagram to answer question 64.



64. If hormone X is FSH, it could

A. stimulate the development of ova
B. inhibit the release of testosterone
C. stimulate the development of the uterine lining
D. inhibit the development of male secondary sex characteristics

---

65. A hormone that initiates the onset of labor in a full-term pregnant woman is

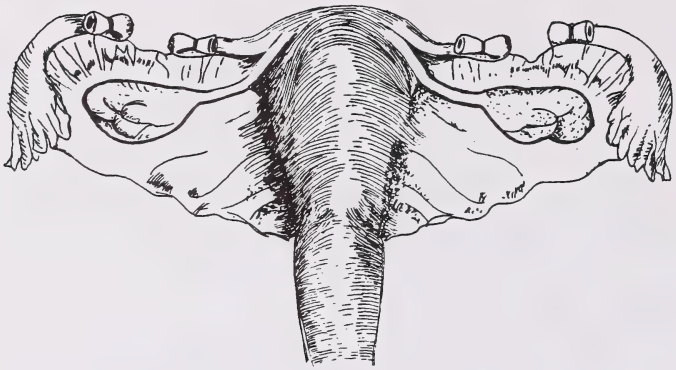
A. oxytocin
B. luteinizing hormone
C. follicle stimulating hormone
D. human chorionic gonadotropin

66. Which hormone inhibits contraction of the uterus?

A. Estrogen
B. Progesterone
C. Luteinizing hormone
D. Follicle stimulating hormone

Use the following information to answer question 67.

Representation of a Tubal Ligation*



*A surgical procedure that involves cutting, tying back, and sealing the Fallopian tubes.

67. As a result of a tubal ligation,

A. eggs will no longer be released into the Fallopian tubes
B. fertilization will occur but implantation is prevented
C. eggs will no longer reach the uterus
D. menstruation will not occur

Use the following information to answer question 68.

Random Order of Events During the Menstrual Cycle

1. The hypothalamus stimulates the pituitary to decrease FSH production and increase LH production.
2. The corpus luteum breaks down.
3. The pituitary releases FSH and LH into the bloodstream.
4. The ovary produces estrogen.
5. The corpus luteum releases estrogen and progesterone.

68. The correct sequence of stimulation and feedback events during the menstrual cycle is

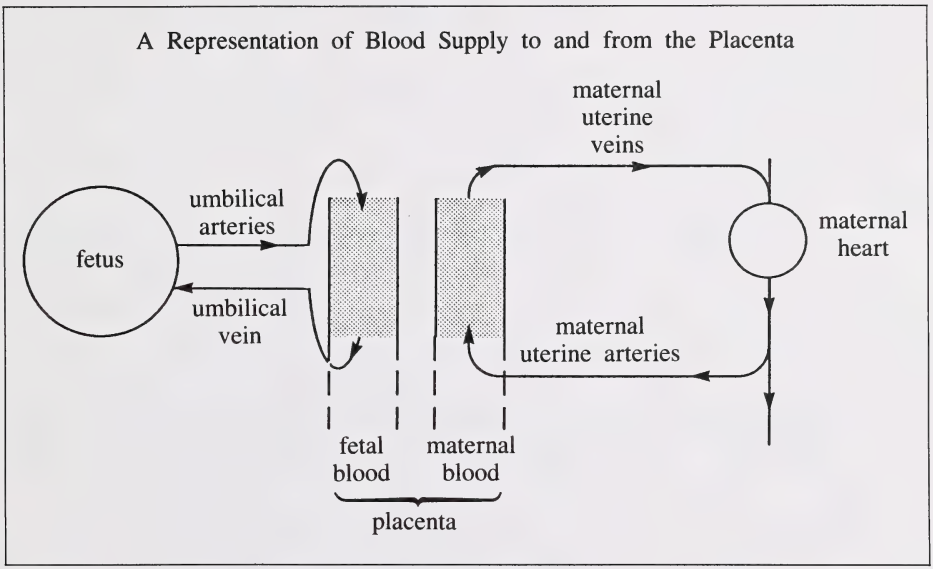
A. 3, 4, 1, 5, 2
B. 3, 5, 4, 1, 2
C. 4, 3, 1, 5, 2
D. 4, 3, 2, 1, 5

---

69. The umbilical cord functions

A. as a site of hormone and metabolic waste exchange
B. as a site of hormone production and nutrient exchange
C. to carry metabolic wastes from the developing fetus to the placenta
D. to carry nutrients and gases from the developing fetus to the placenta

Use the following diagram to answer question 70.



70. Which row in the chart below identifies the relative level of oxyhemoglobin in each of the four types of blood vessels?

Row	Blood Vessel			
	Umbilical Vein	Umbilical Artery	Maternal Uterine Vein	Maternal Uterine Artery
A	low	high	low	high
B	low	high	high	low
C	high	low	high	low
D	high	low	low	high

YOU HAVE NOW COMPLETED PART A. PROCEED DIRECTLY TO PART B.

PART B

INSTRUCTIONS

In this part of the examination, there are five written-response questions for a total of 30 marks.

Read each question carefully.

Write your answers in the examination booklet as neatly as possible.

Communicate your answers in clear, complete sentences unless the response format dictates otherwise. Marks will be awarded for pertinent explanations and answers. Question 3 has two marks allotted for written communication skills.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

START PART B IMMEDIATELY.

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Total: 10 marks

Use the following information to answer question 1.

Many studies have indicated that people who consume moderate amounts of alcoholic beverages, such as a can of beer a day, have a lower risk of developing arteriosclerosis (hardening of the arteries) and heart attacks. Some studies have also shown that blood cholesterol levels drop during the summer months when people who like beer usually drink more of it.

One researcher, however, believes that it is not the beer that lowers a person's risk of heart attacks but the amount of copper in that person's diet — the more copper in the diet, the lower the risk of heart disease.

This researcher developed the hypothesis that a small amount of beer could make up for a deficiency of copper in the diet and therefore lower the risk of heart attack.

Study the first experiment and then answer the questions that follow.

FIRST EXPERIMENT

The researcher designed an experiment in which 100 rats were tested: 50 were given water and 50 were given beer. Both groups of rats were given the same diet, which contained small amounts of copper. The results of this first experiment are summarized in Table 1.

Table 1

Study Group	Length of Life (months)	Blood Cholesterol Levels	Incidence of Heart Disease	Concentration of Copper in Liver Tissue
I. Rats given water	1.5	high	high	low
II. Rats given beer	9.0	low	low	high

Continued

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1. a. Identify the manipulated (independent) variable in the first experiment. **(1 mark)**

_____

_____

b. Identify **two** variables, one of which is related to the rats themselves and the other to the diet fed to the rats, that you believe must have been controlled. **(2 marks)**

_____

_____

_____

_____

_____

c. Table 1 shows four interrelated factors that affected the life expectancy of the rats. What is the correct cause and effect sequence of these four factors? **(1 mark)**

_____

_____

_____

_____

_____

d. State two tentative conclusions that are supported by the results of the first experiment. **(2 marks)**

Conclusion 1: _____

_____

_____

_____

Conclusion 2: _____

_____

_____

_____

Continued

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Study the second experiment and then answer the questions that follow.

SECOND EXPERIMENT

The researcher then extended the study to test the effects of pure alcohol on a third group of 50 rats who were fed the same diet as the other groups of rats. This third group was given the same amount of alcohol that was in the beer consumed by the Group II rats. The results of the second experiment are summarized in Table 2.

Table 2

Study Group	Length of Life (months)	Blood Cholesterol Levels	Incidence of Heart Disease	Concentration of Copper in Liver Tissue
III. Rats given pure alcohol	1.5	high	high	low

The researcher then analysed the beer and found that although it contained alcohol and many other substances, it contained very little copper.

(1 mark)

e. How do the data obtained from Study Group III compare with the data obtained from study groups I and II?

_____

_____

(2 marks)

f. In light of the results of the second experiment, are the tentative conclusions you presented in part d on page 31 still valid? Explain.

Evaluation of Conclusion 1: _____

_____

_____

Evaluation of Conclusion 2: _____

_____

_____

(1 mark)

g. Some scientific research has a direct impact on society. What might have been the impact on society of publishing only the results of the first experiment?

_____

_____

_____

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(4 marks)

Use the following information to answer question 2.

Mature red blood ''cells'' (erythrocytes) do not have many organelles — such as nuclei, ribosomes, and mitochondria — that are found in true cells.

2. a. How does the absence of each of these organelles restrict the cellular processes of erythrocytes?

Nuclei: _____

_____

_____

_____

Ribosomes: _____

_____

_____

_____

Mitochondria: _____

_____

_____

_____

b. Explain how the absence of these organelles facilitates the main function of erythrocytes.

_____

_____

_____

_____

_____

_____

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(6 marks)

3. A soccer player has a breakaway on a goaltender. The goaltender moves out to challenge the opposing player, who kicks the ball to the upper left side of the net. The goaltender immediately flings out an arm and deflects the ball.

The goaltender's eyes serve as receptors for the complex nerve action that results in this deflection of the ball. Describe the nervous system pathways that enabled the goaltender to see and deflect the ball.

(**Four** marks will be allotted for concepts and **two** marks for evidence of logical thought expressed with appropriate vocabulary. You may choose to draw a diagram, in the space immediately below, to illustrate your description.)

CONC

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Continued

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4. The skin is an organ of the integumentary system and covers the entire body like a space suit. When a significant portion of this covering is lost as a result of a severe burn, homeostatic imbalances occur in every system of the body. (4 marks)

Choose any **two** body systems from the list of four and explain how a severe burn, resulting in loss of skin, causes homeostatic imbalances in each system.

1. Circulatory System
2. Excretory System
3. Nervous System
4. Immune System

a. System Name: _____

Explanation: _____

b. System Name: _____

Explanation: _____

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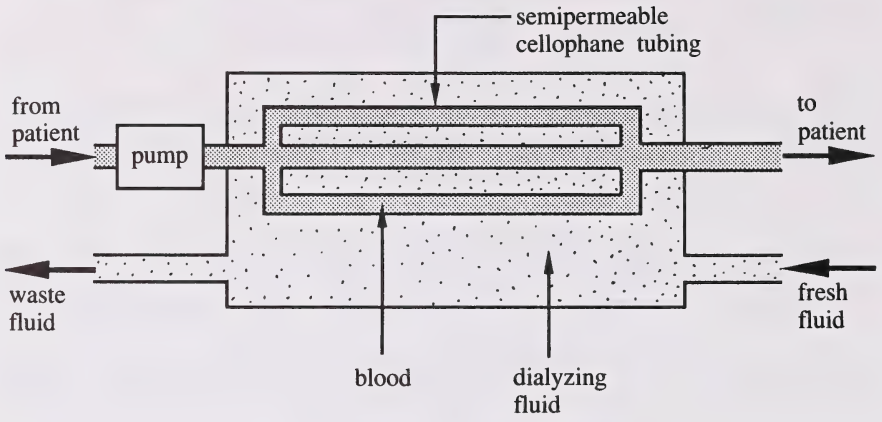
(6 marks)

Use the following information to answer question 5.

A dialysis machine purifies blood by passing it along a semipermeable cellophane tubing that is immersed in a tank of dialyzing fluid.



5. a. What basic process occurs in a normally functioning kidney that does not occur in the dialysis machine?

b. Identify and describe the mechanism (process) by which nitrogenous wastes such as urea are removed from a patient's blood by a dialysis machine.

Continued

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c. Nutrients (glucose, etc.) and electrolytes (sodium, potassium, etc.) can pass through the pores of the dialysis membrane (semipermeable cellophane tubing). Explain how a dialysis machine maintains normal levels of these substances in the patient's blood.

d. Explain why erythrocytes stay inside the semipermeable cellophane tubing and do not enter the dialyzing fluid during dialysis.

YOU HAVE NOW COMPLETED THE EXAMINATION. IF YOU HAVE TIME, YOU MAY WISH TO GO BACK AND CHECK YOUR ANSWERS.

TEAR-OUT PAGE

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FOLD AND TEAR ALONG PERFORATION

TEAR-OUT PAGE

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M1 M2 M3 M4

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